

REMARKS

Reconsideration of the above-identified patent application in view of the amendments above and the remarks following is respectfully requested.

Claims 1-29 are in this case. Claims 1-29 have been rejected under § 102(e).

The claims before the Examiner are directed toward a method by which a host processor communicates over a network, a similar method of direct memory access, and toward associated devices. A first descriptor is written to a system memory. A corresponding command is written to a first doorbell address of a network interface adapter or of a DMA engine. A second descriptor is written, not to the system memory, but to a second doorbell address of the network interface adapter or of the DMA engine. In response to the command being written to the first doorbell address, the network interface adapter or the DMA engine processes the first descriptor. In response to the second descriptor being written to the second doorbell address, the network interface adapter or the DMA engine processes the second descriptor. Note that the writing of the command to the first doorbell address and the writing of the second descriptor to the second doorbell address are examples of “ringing” the corresponding doorbells.

§ 102(e) Rejections – Gronke ‘792

The Examiner has rejected claims 1-29 under § 102(e) as being anticipated by Gronke, US Patent No. 6,888,792 (henceforth, “Gronke ‘792”). The Examiner’s rejection is respectfully traversed.

Gronke ‘792 teaches a method by which nodes communicate with each other over a plurality of fabrics. Each node has a set of physical ports associated with each fabric and a map that associates physical ports with virtual ports. Each node includes

a network interface controller (NIC) 18, for example a host channel adapter (HCA) 210 or a target channel adapter (TCA) 242, that associates the node's data transfer operations with respective virtual ports. When a fabric fails, NIC 18 remaps the virtual ports associated with the failed fabric to virtual ports that are associated with functioning fabrics.

The node notifies NIC 18 of direct memory access data transfer operations in the conventional manner. The node posts descriptors 23 of a data transfer operation in a send queue 21 or in a receive queue 19 and then rings the associated doorbell 25 or 27. This is stated explicitly in Gronke 792 in column 2 lines 17-22:

A send doorbell 25 and a receive doorbell 27 are provided for allowing the VI consumer to notify the VI NIC 18 that work has been placed in the send queue 19 and receive queue 21, respectively, meaning that a descriptor describing a requested data transfer operation has been placed in queues 19 and 21. (emphasis added)

and in column 5 lines 50-56:

According to an example embodiment, the host node...places descriptors into send queues for a send operation or into receive queues for a receive operation, and then rings a doorbell to notify the HCA that work has been placed in the work queues. The HCA then sends or receives the data over a channel. (emphasis added)

By contrast the present invention provides two ways to notify a NIC or its equivalent of direct memory access data transfer operations. The first way is the conventional one used by Gronke '792. The second way is to ring a doorbell by writing descriptors directly to the doorbell. (The purpose of the second way is to give the associated data transfer operations priority over the data transfer operations that are handled in the conventional manner.) This aspect of the present invention is recited in the claims by using two different ways to recite the first and second ways of notifying a NIC or its equivalent of data transfer operations.

The first way of notifying a NIC or its equivalent of a data transfer operation is recited in claim 1 as the steps of:

writing a first descriptor to a system memory...
writing a command to a first one of the doorbell addresses...
responsive to the command having been written to the first one of the doorbell addresses, reading the first descriptor from the system memory...

in claim 10 as the steps of:

writing a first descriptor to a system memory...
writing a command to a first doorbell address of the DMA engine...
responsive to the command written to the first doorbell address, reading the first descriptor from the system memory...

in claim 15 as follows:

a doorbell handler, which is coupled to the range of doorbell addresses so as to receive a command written...to the first doorbell address, indicating that the first descriptor has been written to a system memory...the doorbell handler being further coupled, responsive to the command having been written to the first doorbell address, to instruct the execution circuitry to read the first descriptor from the system memory and to execute the first descriptor...

in claim 24 as follows:

a doorbell handler, which is coupled to the range of doorbell addresses so as to receive a command written...to the first doorbell address, indicating that the first work request has been written to a system memory...the doorbell handler being further coupled, responsive to the command having been written to the first doorbell address, to pass instructions to the execution circuitry to read the first work request from the system memory and to execute a first work queue element corresponding to the first work request...

and in claim 25 as follows:

a doorbell handler, which is coupled to the range of doorbell addresses so as to receive a command...to the first doorbell address, indicating that the first descriptor has been written to the system memory...the doorbell handler being further coupled, responsive to the command having been written to the first doorbell address, to instruct the DMA engine to execute the first operation responsive to the first descriptor in the system memory...

The second way of notifying a NIC or its equivalent of a data transfer operation is recited in claim 1 as the steps of:

writing a second descriptor to a second one of the doorbell addresses...

responsive to the second descriptor having been written to the second one of the doorbell addresses, sending the second message from the network interface adapter over the network.

in claim 10 as the steps of:

writing a second descriptor to a second doorbell address of the DMA engine...

responsive to the second descriptor having been written to the second doorbell address, executing the second descriptor using the DMA engine.

in claim 15 as follows:

a doorbell handler, which is coupled to the range of doorbell addresses...so as to receive the second descriptor written...to the second doorbell address...the doorbell handler being further coupled...responsive to the second descriptor having been written to the second doorbell address, to pass the second descriptor to the execution circuitry and to instruct the execution circuitry to execute the second descriptor...

in claim 24 as follows:

a doorbell handler, which is coupled to the range of doorbell addresses...so as to receive the second work request written by the host processor to the second doorbell address, the doorbell handler being further coupled...responsive to the second work request having been written to the second doorbell address, to pass a work queue element corresponding to the second work request to the execution circuitry to execute the second work queue element...

and in claim 25 as follows:

a doorbell handler, which is coupled to the range of doorbell addresses...so as to receive the second descriptor written by the host processor to the second doorbell address, the doorbell handler being further coupled...responsive to the second descriptor having been written to the second doorbell address, to instruct the DMA engine to execute the second operation.

Therefore, the teachings of Gronke '792 have absolutely nothing to do with the present invention. There is neither a hint nor a suggestion in Gronke '792 of

having two ways to ring a doorbell. Therefore, independent claims 1, 10, 15, 24 and 25 are allowable in their present form. With independent claims 1, 10, 15 and 25 allowable in their present form, it follows that claims 2-9, 11-14, 16-23 and 26-29 that depend therefrom also are allowable.

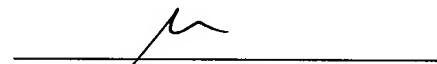
Amendments to the Specification

Page 15 lines 28-29 have been amended to reflect the fact that US 09/870,016 has been issued as US 6,735,642.

No new matter has been added.

In view of the above amendments and remarks it is respectfully submitted that independent claims 1, 10, 15, 24 and 25, and hence dependent claims 2-9, 11-14, 16-23 and 26-29 are in condition for allowance. Prompt notice of allowance is respectfully and earnestly solicited.

Respectfully submitted,


Mark M. Friedman
Attorney for Applicant
Registration No. 33,883

Date: December 8, 2005